Advanced Air Mobility
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July 2016 to July 2019
  Director-General, Safety and Security Department, JCAB, MLIT

Feb. 2014 to June 2019
  Director, Flight Standards Division, JCAB, MLIT

April 2012 to Feb. 2014
  Director, Office of Air Transport Safety, JCAB, MLIT

Oct. 2009 to March 2012
  Director, Airworthiness Division, JCAB, MLIT

April 2005 to Sep. 2009
  Senior Air Talks Officer, International Air Transport Division, JCAB, MLIT
ANÀ’s Overview

**Scale**
- Total ANA Group Passengers (FY2019): 59.62 million
- ANA Domestic Passengers*: (2019)
  - Global No. 17
  - Total ANA Domestic and International Passengers*: (2019)
  - Global No. 22
- Share of Domestic Passengers*: (FY2019) No. 1 (46%)
- Number of Aircraft (as of the end of FY2019): 307 aircraft total
  - Wide-Body: 59
  - Medium-Body: 107
  - Narrow-Body: 117*
  - Regional: 24
  * Includes aircraft operated by Peach Aviation
- ANA Mileage Club Members (as of the end of FY2019): 36.65 million
- Cargo Volume (FY2019): 1,239 thousand tons

**Quality**
- In-Service Rate 97.4%
- On-Time Departure Rate 88.7%
- On-Time Arrival Rate 87.5%
- Number of Customer Feedback Reports
  - FY2015: 73,688
  - FY2019: 117,628
- External Recognition
  - SKYTRAX (ANA, 2020)
    - 5-STAR AIRLINE
    - for an 8th consecutive year
- By Category:
  - World’s Best Airport Services (2018)
  - Best Business Class Onboard Catering (2019)
- JCSI (Japan Customer Satisfaction Index) Survey (ANA, FY2019)
  - International Aviation Division, Customer Satisfaction
  - No. 2
ANA’s Pioneering DNA

1952
Nippon Helicopter (NH) established

1986
International scheduled services

1993
“Marine Jumbo” painting (Special Airplane Livery)

1999
Joined Star Alliance

2000
Launched “Inspiration of Japan” (New Staggered Seats)

2009
Launched LCC service

2010
Introduced the Boeing 787 (Launch Customer)

2011
Launched “Inspiration of Japan” (New Staggered Seats)

2012
Established ANA Holdings

2013
Launched LCC service

2014
Established ANA Business Jet

2015
Established AVATARIN.INC

2016
Operated Star Wars Jet

2018
Launched Drone/Air Mobility PRJ

2019
Established ANA Business Jet

2020
After Covid

Established AVATARIN.INC

AN A × Virgin Orbit

ANA Drone × Wingcopter

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Advanced Air Mobility

Background

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Advanced Air Mobility

Background
What is AAM (Advanced Air Mobility)?

- Uber proposed a concept of UAM (Urban Air Mobility) in 2016, which intends to integrate eVTOL (Electric Vertical Take-off and Landing aircraft) into transportation systems in urban area. *(Uber White Paper)*

- Later, the concept is expanded to AAM (Advanced Air Mobility), which includes other applications of eVTOL, such as inter-city, regional and rural, cargo, medical transportation.

- There are high expectations on the concept of AAM (e.g. market forecast) and it attracts big investment.
Benefit of eVTOL

eVTOL can be defined as:
"an aircraft with multiple electric motors/rotors which provide thrust, and can take-off and land vertically"

◆ Benefit of eVTOL compared with Conventional VTOL

- Less complexity and less parts
- No single point of failure
- Easier to fly (Going to be Pilotless)
- Lower rotor speed

Higher SAFETY

More ENVIRONMENTALY Friendly (CO₂, Noise)

Lower COST (Operations, Maintenance, etc)
How AAM will evolve?

UML (UAM Maturity Level) defined by NASA
ANA’s Plan and Development in Japan

Advanced Air Mobility
Japan’s AAM Market

PwC Japan estimates that Japan’s AAM market will grow to 2.5 trillion yen in 2040.

By 2040, the market scale of AAM may expand to 2.5 trillion yen. The key is to organize infrastructure and system requirements, especially with passenger transportation in mind, as well as aircraft development and institutional design.

Source: PwC Japan
## ANAHD’s Use Case

Starting with the Airport Shuttle Services, we will expand Services to Intra-City/Inter-City Air Transportation, and to On-Demand Air Taxi Services, to establish Urban Air Mobility and Advanced Air Mobility.

<table>
<thead>
<tr>
<th>Description</th>
<th>Network (image)</th>
<th>Time to implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airport Shuttle Service</strong></td>
<td>KIX/UKB-Yumeshima</td>
<td>2025 and thereafter</td>
</tr>
<tr>
<td></td>
<td>HND/NRT-Tokyo city</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NGO〜Nagoya city</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OKA〜Several resort</td>
<td></td>
</tr>
<tr>
<td><strong>Inter/Intra City Transport Service</strong></td>
<td>In Tokyo urban area</td>
<td>2026 and beyond</td>
</tr>
<tr>
<td></td>
<td>In Osaka urban area</td>
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<tr>
<td></td>
<td>In Chubu urban area</td>
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<tr>
<td></td>
<td>In Okinawa island area</td>
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<tr>
<td></td>
<td>Other area</td>
<td></td>
</tr>
<tr>
<td><strong>On Demand Air Taxi</strong></td>
<td>In Tokyo urban area</td>
<td>2030~</td>
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<tr>
<td></td>
<td>In Osaka urban area</td>
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<td>In Chubu urban area</td>
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<td>In Okinawa island area</td>
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<tr>
<td></td>
<td>Other area</td>
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<tr>
<td><strong>Air Metro</strong></td>
<td>The aircraft can carry 10 passengers like</td>
<td>2035~</td>
</tr>
<tr>
<td></td>
<td>a bus or van, and will provide</td>
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<tr>
<td></td>
<td>transportation as a general public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>transportation infrastructure.</td>
<td></td>
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</tbody>
</table>
Potential Network Area of airport shuttle services

Starting with the Kansai area for Expo 2025, we aim to expand to Kanto, Chubu and Okinawa. In order to secure a "PORT" for takeoff and landing and a "BASE" for maintenance and management of the aircraft.
Potential Vertiport Place in Greater Tokyo Area

Tokyo Greater Area eVTOL Potential Network Based on Haneda Airport

- Haneda~Shinjuku
  - Car/Train: 30~45min
  - eVTOL: 8minFLT
  - ~30min time saving

- Haneda~Tsukuba
  - Car/Train: 90~100min
  - eVTOL: 20minFLT
  - ~80min time saving

- Haneda~Hakone
  - Car/Train: 90~120min
  - eVTOL: 30minFLT
  - ~90min time saving
ANAs AAM (Advanced Air Mobility) Services (Conceptual Image)

Supporting Elements

**Characteristics of Operations**

- FAA/EASA Type Certification & JCAB TC
- Initial Passenger Services (EXPO = Kansai Airport, Kobe Airport, Downtown Osaka)
- Services Expanded (Expanded Services in Osaka incl. urban services + Similar Services in Tokyo, Nagoya, and Okinawa)
- More Matured Services (Urban/Regional Mobility)

**Integration with Ground Transportation**

- Pilot On-board (Increased Automation)
  - Low/Medium Density
  - Low/Medium Complexity
- Autonomous (Pilotless)
  - High Density
  - High Complexity

**Vehicle Operation**

- Preparatory Works
- Preparation for Service launch
- Service Launch in Osaka EXPO
- Expand Operation Area Kansai, Tokyo, Chubu, Okinawa

**Initial Passenger Services**

- Initial Set of Regulations to accommodate eVTOL
- FAA/EASA Type Certification & JCAB TC
- FAA/EASA Type Certification & JCAB TC
- FAA/EASA Type Certification & JCAB TC

**Regulation/Operation Environment**

- Updated Regulatory Frameworks as new technologies introduced
- Evolve as Operations/Technologies Advanced and Regulations Updated
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- Evolve as Operations/Technologies Advanced and Regulations Updated

**Existing & New Infrastructures**

- (Vertiport, Air Traffic Management)
- (Vertiport, Air Traffic Management)

**Currently Available Technologies/Procedures**

- Advanced Technologies developed and verified to support Autonomous/Higher density/Higher Complexities
Commitment to AAM by The Japanese Government

JAPANESE GOVERNMENT
Action Plan of the Growth Strategy

Realization of Society 5.0

Fintech
Digital Market
COVID-19

“Air Mobility”
Goal
2023: Start eVTOL Commercial Services
2025: PAX Services in Osaka EXPO 2025

New Work Styles
Next Gen Infrastructure
Open Innovation
Carbon Free Society

Reforms of Social Security System for All Generation
Reinforcement of Regional Measures under Population Decline
Public-Private Council for Air Mobility Revolution

JAPANESE GOVERNMENT
Action Plan of the Growth Strategy 2018

Established Public Private Council for Japan’s AAM

Public Sector

• MLIT JCAB
• METI

Observer

• Ministry of Internal Affairs and Communications
• Fire and Disaster Management Agency, Logistics Policy Division, MLIT
• General Policy Bureau, MLIT
• City Policy Division, City Bureau, MLIT
• River Environment Division, MLIT
• Planning Division, Road Bureau, MLIT

Private sector

Academia/Research Institute

• Shinji Suzuki Tokyo University
• Wataru Nakano Keio University
• JAXA
• SJAC
• AJATS
• Drone Fund

Service Supplier

• ANA HOLDING
• JAPAN AIRLINE
• AirX
• YAMATO HOLDINGS
• RAKUTEN
• ORIX

Manufacturer/Industry

• AIRBUS JAPAN
• SUBARU
• BELL
• Boeing Japan
• Uber Japan
• CARTIVATOR
• SkyDrive
• KAWASAKI HI
• Terra Aviation
• NEC
• ACSL
• PRODRONE

Schedule and agenda in PPC

Aug~Dec 2018 #1~#4
• Made the roadmap
• Ministry MLIT and METI also took the stage.

Aug 2019
Local Government presentation

Mar 2020 #5
• Business Model
• Identifying the issue

Jun 2020 #6
• Summary of FY19

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Roadmap toward Air-Mobility Revolution (20th Dec, 2018 Public-Private Council for Air Mobility Revolution)
<table>
<thead>
<tr>
<th>Year</th>
<th>Vision</th>
<th>Major Use Case</th>
</tr>
</thead>
</table>
| 2023 | Start to Initial operation  
  • Passenger transportation service between two points in limited areas  
  • Launch of cargo transportation service in remote island areas | Multirotor type, 2 passengers, All Electric, Pilot On board, MTOW 500-600 kg, VFR, Altitude 50-150 m, the existing Helipad |
| 2025 | Start to commercialization of transportation  
  • Multiple fixed-route, scheduled services, such as airport shuttle  
  • Cargo services in urban areas. (Pilotless) | Osaka Bay Area (Osaka City/Expo island/Airport)  
  • Multirotor/Vectored Thrust, 2-5 passengers, All-Electric, Pilot On board, New Vertiport, the existing helipad, VFR, congested airport. |
| 2026~ | Expand to transportation service/Medical and Emergency Services  
  (To be defined) | |
| 2030~ | More Expansion of networks and On Demand Ops  
  (To be defined) | |
Public Private council for Japan’s AAM

Public Private Council for Future Air Mobility Revolution was established in AUG 2018, released “AAM Development Roadmap” in DEC 2018 as a result of its initial deliberation. It plans to revise the “Roadmap” in FY2021.

Recent work and future actions

- Each WG have identified issues to be resolved under the current framework including regulations and procedures for the services envisaged until 2025.

- In 2021 and onward, considerations and discussions will be conducted and necessary actions will be taken in a timely manner, for the resolution of those issues to help realize commercial services of eVTOL, including setting-up of various technical and safety standards.

- In particular, Concept of Operation of ATM for initial stage of implementation will be finalized in FY21.
OSAKA EXPO 2025 and AAM

Master Plan released by the Osaka Expo Committee (December 2020) has incorporated a vertiport (the Mobility Experience Area) for eVTOL services.
Osaka and other Local Governments are supportive for realization of eVTOL services

**Osaka**
Osaka governor is aggressive to realize of eVTOL operation. The public private council was established for OSAKA AAM.

**Mie**
One of the plans is to connect ISE shrine as major sight seeing spot in Mie with nearest international airport Centrair.

**Fukushima**
Robot Test Field “50ha” in Fukushima.

**Tokyo**
There is huge population in Tokyo greater area
Barriers and Challenges

**Short Term (Airport Shuttle Services)**

- Going through necessary regulatory requirements
  - Certification of eVTOL/ Licensing of Pilot/ Air Operator Certificate

**Securing Vertiports**

- Flexible access to congested airports
- Access to existing/ new heliport in big cities

**Safe and Reliable Services**

- Operations in bad weather

**Public Acceptance**

- Particularly important to access to the populated area
- Safety, Environment, Privacy and Annoyance. Understanding from the public/ community

**Scalable**

- Flexibility in ATM (Air Traffic Management) systems/ procedures, maintaining co-existance with other traffic
Barriers and Challenges

Longer Term
(Future Services: High Density, High Complexity, Fully Automated/ Autonomous)

Update Regulatory Framework, in parallel with technological development
- Vehicle Automation/ Pilotless operations/
- New Technologies (V to V Com., DAA, Interface with new traffic management, etc.)

Innovative Concept in ATM
- Airspace dedicated to AAM
- Unique set of rules and procedure for AAM/ Automated traffic management

Safe and Reliable Services

Security
- Cyber Security
- Security in operations without onboard pilot

Public Acceptance
- Are PAX OK with pilotless operations?
Thank you!
Comments or Questions